May 26, 2016

Clerk of the Board
Air Resources Board
1001 I Street
Sacramento, CA 95814

Re: Proposed Short-Lived Climate Pollutant Reduction Strategy

Dear Sir/Madam:

Bluon Energy, based in California, is uniquely positioned to comment on the draft Short-Lived Climate Pollutant Reduction Strategy issued by the California Air Resources Board (ARB) ("proposed SLCP Reduction Strategy" or "proposed Strategy") because it is an energy-focused refrigerant company. Bluon has developed an effective and efficient refrigerant called TdX 20 which is a replacement product for HCFC-22 (also known as R-22), a widely used refrigerant which has significant ozone depleting potential (ODP) and global warming potential (GWP).

The principal subject of Bluon's comment is the proposed hydrofluorocarbon (HFC) supply phase-down along with the prohibition on use of high-GWP refrigerants in new equipment. We recommend that a transition to lower GWP refrigerants should correlate to net greenhouse gas (GHG) abatement and energy efficient refrigerants that can be used in existing heating, ventilation and air conditioning (HVAC) and refrigeration equipment over the next 5-20 years while continual innovation takes place.

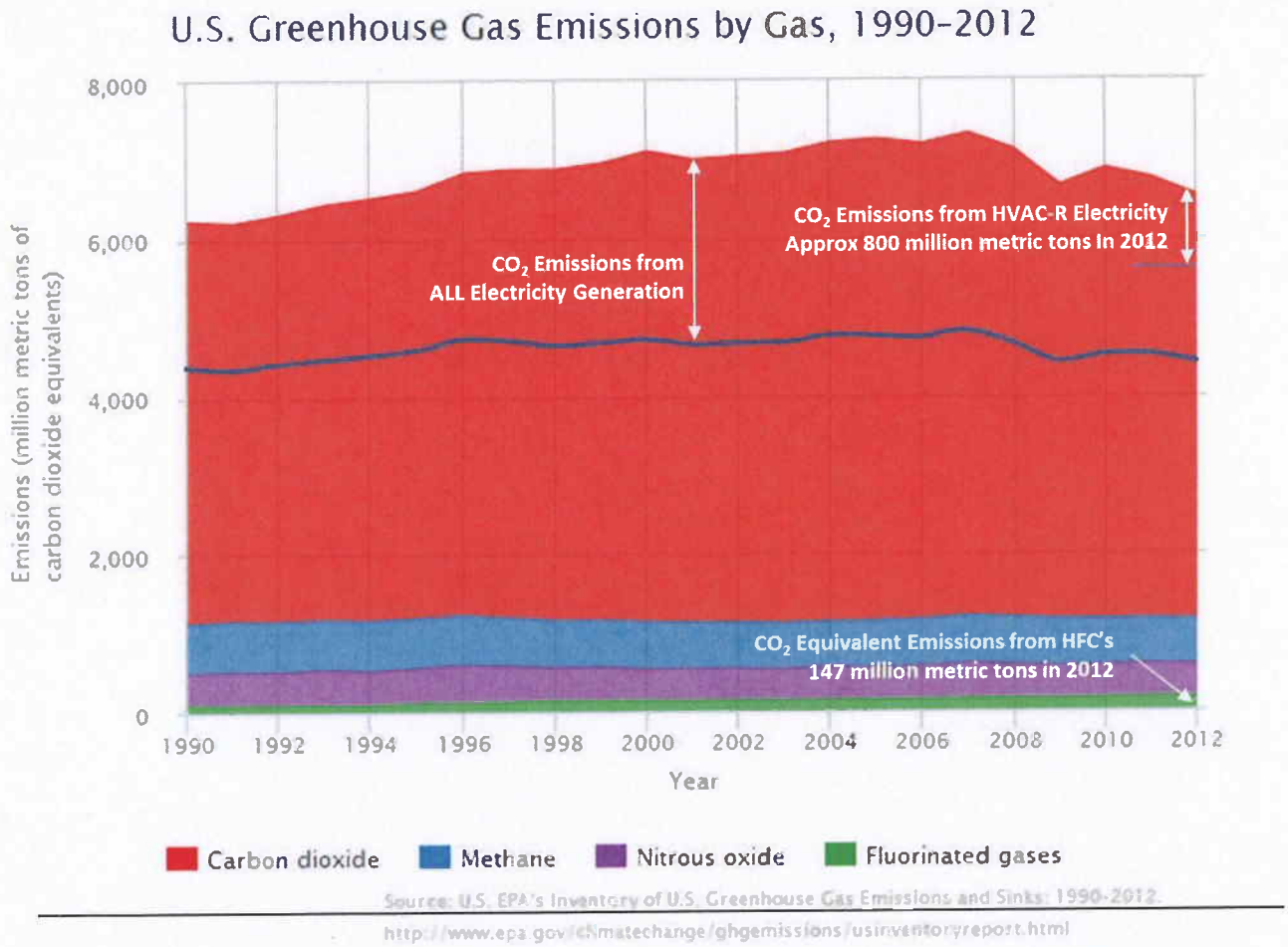
Bluon's Product/Interest

Bluon supports the goal of reduction of SLCP emissions in California and beyond. Bluon has developed a science-based approach that achieves *both a substantial reduction in GWP from R-22 and current R-22 alternatives as well as increased energy efficiency.*[1] Bluon's product,

[1] R-22 is used globally in some 80% of existing HVAC equipment. An estimated one trillion pounds of R-22 is currently installed in US systems.

TdX 20, is a blend of HFCs that has a GWP of 1650, the lowest compared with GWPs of 1810 for R-22 and 2088 for R-410A and 1774 for R-407C, the most common R-22 alternatives.[2] While GWP alone cannot serve as a solitary metric of environmental impact, TdX 20 is superior to current alternatives by this measure along with providing incomparable energy efficiency.

With regard to climate change, far more important than a refrigerant's GWP is its relative efficiency in use. The energy efficiency of a refrigerant can have a much greater impact on overall GHG than its associated GWP. This point is illustrated by the following table, which shows how the emissions from electricity generated to run HVAC equipment dwarf the impact of HFC leakage from that equipment:



[2] Sale in interstate commerce of TdX 20 as an alternative to HCFC-22 in residential and light commercial air conditioning and heat pumps is allowed by the US Environmental Protection Agency (EPA) pending a determination of its acceptability as an alternative under the Significant New Alternatives Policy (SNAP) program, expected soon. *See* Letter from Robert Landolfi to Charles Hawkins: Completeness Determination for SNAP Submission for TdX 20 (May 13, 2015).

GWP considers the impact of leakage, by measuring the CO_2 equivalent of a refrigerant being released into the atmosphere. However, GWP calculations fail to consider the energy efficiency associated with those CO_2 emissions. This inflexible approach focuses solely on low-GWP alternatives without accounting for the increased CO_2 emissions from alternatives that are less energy efficient. A more flexible science-based approach would account for energy efficiency along with low-GWP alternatives.

Further support for this point can be seen when considering a replacement refrigerant that has the same GWP as R-22, along with 10% greater energy efficiency. In a 10-ton unit, the replacement can reduce CO_2 emissions by more than 3,800 pounds or nearly 2 metric tons per year. By contrast, a low-GWP alternative (< 150) in the same equipment – assuming it operates at the same efficiency versus what it is replacing – would only achieve a reduction of 1,900 pounds or nearly 1 metric ton per year.[3] This example is even more compelling considering that most low-GWP alternatives are known to be less efficient. All it takes to offset the benefits of the low-GWP alternative is a 6% decrease in energy efficiency (in this example).

There is growing awareness of Functional GWP (F-GWP): CO_2 emissions from electricity consumption plus CO_2 equivalent of GHGs being released into the atmosphere.[4] EPA recently recognized the importance of energy efficiency in assessing climate impact:

> "The total environmental effects impacts [sic] of these refrigerants also depend upon the energy use of appliances, since the 'indirect' GHG emissions associated with electricity consumption typically exceed those from refrigerants over the full lifecycle of refrigerant-containing products. *If appliances designed to use refrigerants listed as acceptable in this final rule are less energy efficient than the appliances they replace, then it is possible that these appliances would result in higher lifecycle GHG emissions than appliances using a higher GWP refrigerant or refrigerant substitute.*"[5]

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[3] The proposed Strategy states that "[s]everal refrigerants are currently available with a 100-year GWP of less than 1500 that can be used in existing equipment designed for higher-GWP refrigerants" but fails to account for the energy efficiency of those low-GWP alternatives. *See* proposed Strategy, p. 88.

[4] *See* Executive Order 13693, 80 Fed. Reg. 15781 (March 25, 2015), establishing sustainability goals for US Executive Departments and Agencies, which defines 'Scope 2' GHG emissions as "direct greenhouse gas emissions resulting from the generation of electricity, heat, or steam purchased by an agency."

[5] Protection of Stratospheric Ozone: Listing of Substitutes for Refrigeration and Air Conditioning and Revision of the Venting Prohibition for Certain Refrigerant Substitutes, 80 Fed. Reg. 19,454, 19,469 (Apr. 10, 2015) (emphasis added).

The Proposed Strategy's Prohibition on Use of High-GWP Refrigerants in New Equipment, Without Regard to Energy Efficiency, Would Actually Increase GHG Emissions

As noted above, the proposed Strategy would foreclose use in new refrigeration equipment of HFCs/HFC blends having a GWP greater than 150, and use in new air conditioning equipment of HFCs/HFC blends having a GWP greater than 750. This approach will not solve the problem described in the proposed Strategy:

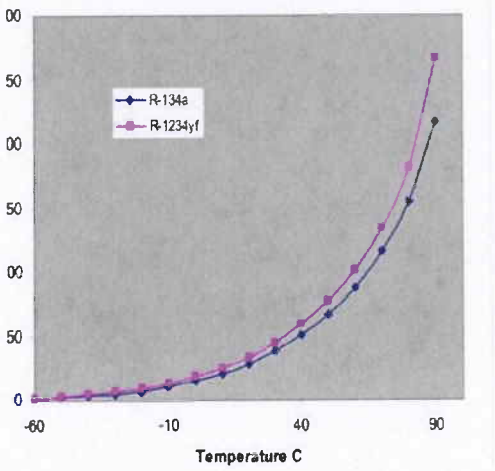
> "Data reported under the existing Refrigerant Management Program indicates that more than 2,400 facilities with large commercial refrigeration systems in California currently use HCFC-22 refrigerant. This refrigerant has not been allowed in new equipment since January 2010, and all new production and import will cease by January 1, 2020. Therefore, these facilities must either buy increasingly scarce recycled HCFC-22 to maintain their systems, or replace or retrofit their existing systems with another refrigerant within five years."[6]

Because the current alternatives available for new HVAC and refrigeration systems are neither low-GWP nor energy-efficient, the real-world impact of adoption of the proposed SLCP Reduction Strategy would be to mandate new equipment that is perhaps lower GWP but certainly not more energy-efficient. A proposed alternative would be to encourage R-22 replacement refrigerants that meet minimum standards for lower GWP as well as energy efficiency. The proposed Strategy in its current form would result in *increased* GHG emissions—an unintended consequence of encouraging replacement of R-22 equipment with that designed for R-410A. As HVAC equipment can have a 30-year lifetime, purchase of such equipment before the proposed prohibition comes into place in 2021 would 'lock in' use of this less efficient, higher GWP alternative until the middle of the century.

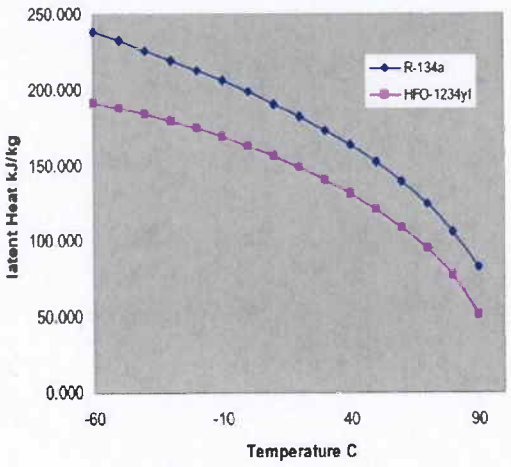
The Strategy assumes that low-GWP alternatives will come into the HVAC market by 2020. The rapid development of the low-GWP HFO alternatives seems less likely for refrigeration and air conditioning because of the energy-efficiency constraints discussed above. This fact is illustrated by contrasting R-1234yf, which has very low GWP, with R-134a, which has a higher GWP but is more efficient:

[6] Proposed SLCP Reduction Strategy, p. 86.

Calculated Vapor Density



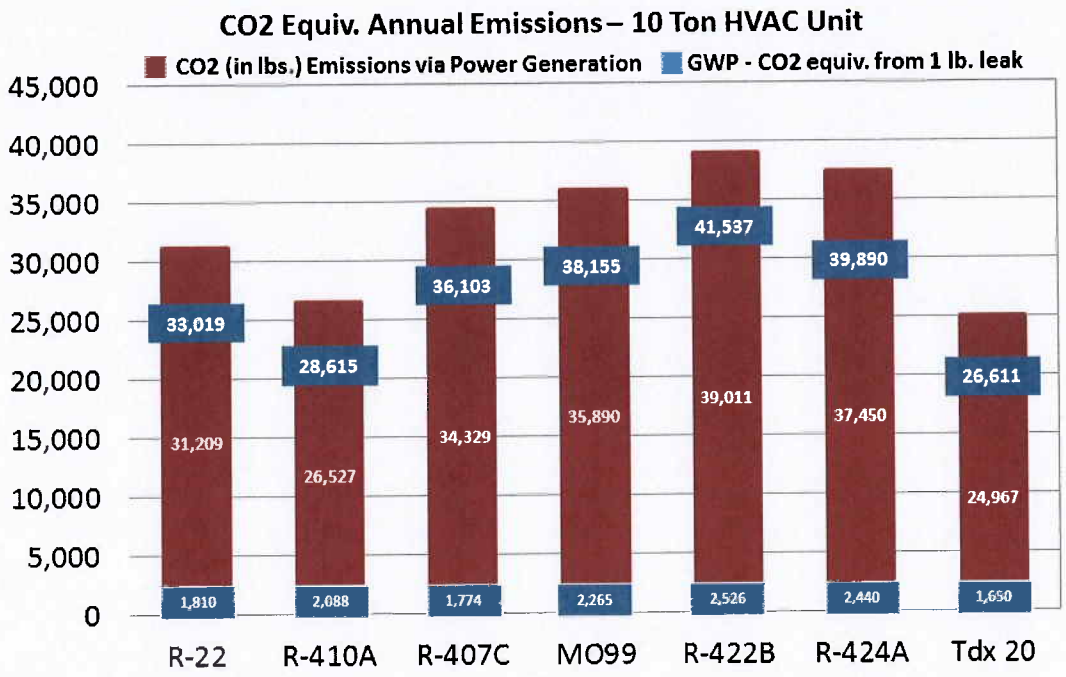
Calculated Latent Heat



The foregoing graphic on the right demonstrates that the reduced energy efficiency of R-1234yf (graph on the left) essentially eliminates the environmental benefit from the lower GWP of the product. This decrease in energy efficiency means that more electricity needs to be generated which in turn increases the overall CO_2 emissions associated with R-1234yf and ultimately contributes to an overall increase in GHGs with R-1234yf

TdX 20 can extend the lifetime of existing R-22 equipment and provides the advantage of improved energy efficiency which reduces overall CO_2 emissions. Using TdX 20 refrigerant postpones the purchase of costly R-410A equipment, which is already being targeted by EPA and ARB for phase out, and buys time to allow low-GWP HVAC equipment to be developed. As illustrated below, TdX 20 results in lower overall GHG emissions than any of the HFC alternatives currently available:

Functional GWP



Strategy Is Based on Unrealistic Assumptions

Appendix D presents technical information and calculations to support the economic analysis in the Proposed Strategy. With regard to its discussion of the proposed prohibition on use of high-GWP refrigerants in new stationary refrigeration and air-conditioning equipment, however, the analysis is seriously deficient. For example, it assumes that the incremental cost of adding low-GWP equipment will be offset by reduced energy usage from using low-GWP refrigerants. While it notes that R-22 has the same or better energy efficiency relative to most low-GWP refrigerants, "new HCFC-22 equipment has been prohibited since January 1, 2010, and therefore cannot be considered as baseline for new equipment."[7]

This completely ignores the reality that the existing HVAC infrastructure in California, as elsewhere in the United States, is approximately 75% R-22 and 25% R-410A, and that the existing R-22 equipment will largely remain in place at least through 2020 with ample supply of

[7] *Appendix D: Supporting Documentation for the Economic Assessment of Measures in the Proposed Strategy*, p. 45.

HCFC-22, both new and reclaimed, assured by regulatory measures taken by EPA.[8] Compared to R-22, the low-GWP refrigerant alternatives are less efficient and will increase GHG emissions significantly over the real baseline as a result of increased energy consumption.

Not only will R-22 equipment remain in operation for the foreseeable future, the low-GWP refrigerants assessed in Appendix D cannot be used commercially because of flammability and toxicity. Use of such refrigerants will require changes to building codes and insurance riders that may not be forthcoming and in any event follow multi-year cycles. And even if equipment utilizing HFOs were available, the HFOs that are A2-L as established by ASHRAE could not be installed by commercial users.

Conclusion

Adopting a strategy that creates bright-line restrictions focused solely on encouraging low-GWP alternatives will not achieve the desired overall CO_2 reduction. Any effective strategy considered by ARB must also account for energy efficiency. Bluon looks forward to working with ARB staff on developing a final strategy that effectively incorporates energy efficiency as a means to achieve ARB's goal of reducing global warming.

Respectfully submitted,

Douglas Reinke /WCN

Douglas J. Reinke
President & CEO

[8] *E.g.*, EPA's final allocation rule provides for production and import for US consumption of 30,000 metric tons of HCFC-22 through 2019, on top of the enormous inventory existing at the time the allocation rule was adopted. 79 Fed. Reg. 64253 (Oct. 28, 2014).